second median branches also lie close together for almost their entire length, the third being further apart from them.

75. *Phlogothauma scintillans*, sp. n.

Primaries above golden cupreous, with fiery-pink reflections; a tapering hyaline marginal band from the inner margin to above the upper radial vein, slightly tinted with yellow; costal and external borders, inner margin, subcostal and median veins, and the outer two thirds of the radials purplish black: secondaries with the basal half from costa to submedian vein golden cupreous, with fiery reflections; abdominal and external areas hyaline, slightly yellowish, and traversed by black veins; fringe purplish black, with a few cupreous scales along the internal edge (as also in the primaries): body blue black; front of head and collar pearly white; palpi, coxæ, and under surface of femora brassy yellow; the broad tibial fringe of anterior legs purplish black, golden cupreous at the base. Expanse of wings 34 millim.

New Britain.

Hyponomeutidæ.

76. *Corinea aurata*, sp. n.

Primaries shining metallic golden: secondaries with the interno-basal half reddish golden (or golden ochreous), the apical half dark grey, shot with emerald-green: body golden. Primaries below and apical half of secondaries smoky grey, with slight purplish (or plum-coloured) reflections; the base of primaries and interno-basal half of secondaries golden ochreous; pectus dark brown, with large lateral silvery-white patches: the legs bronze-brown, with one or two white bars, the tarsi pale; venter golden ochreous, banded with white. Expanse of wings 25 millim.

Duke-of-York Island.

XXI.—*On the Structure and Functions of the Elytra of the Aphroditacean Annelids.* By William A. Haswell, M.A., B.Sc.

The possession of elytra, or scales, is one of the most characteristic peculiarities in the structure of the Aphroditacea. These elytra are thin squames of varying shape, but always more or less rounded, sometimes delicate and membranaceous, at other times stiff and horny, which cover the back of the

annelid in a double row. Each elytron is attached to a peduncle or "scale-tubercle," the surface of attachment, of circular or oval form, being situated about the centre of the elytron, and the attachment being effected through the intermediation of a series of muscular fibres, by whose contractions the various movements of the scales are brought about. The elytra are usually attached to every alternate segment, the intermediate segments having as their equivalents the cylindrical dorsal cirri. In structure and mode of development the elytra and the cirri may be said to be essentially identical. Each consists of an infolding of the integument enclosing a nerve, the infolding in the one case taking a cylindrical form, while in the other it becomes compressed and scale-like. Such a cutaneous fold ought to contain representatives of the cuticular, the subcuticular, and the muscular layers of the integument; and such we find to be actually the case. Each scale contains three principal tissues, viz. (1) an investing cuticle, (2) a double layer of cells or cell-equivalents, and (3) a fibrous layer.

(1) The cuticle varies considerably as regards its degree of development. Sometimes, as in *Aphrodita* and *Hermione*, it is exceedingly delicate, and develops no appendages; in other cases, as in *Iphione* and many species of *Lepidonotus* and allied genera, its upper layer attains a considerable thickness and density, and may be variously sculptured on the upper surface; where appendages are present, such as fimbriæ or bristles, it forms an investment for them when it does not constitute their entire substance.

(2) The cell-elements, representing the subcuticular layer of the general integument, take the form of a complete layer of polygonal squames lying immediately beneath the cuticle. This layer is sometimes transparent, the outlines of the cells being only discernible with difficulty; at other times the cells are charged wiith pigment-granules, a lighter space in the centre being apparently the expression of a nucleus. This double layer of cells was first pointed out by Ehlers* in *Polynoë pellucida*. I have found it in most of the species which I have examined, though in some cases it does not appear to be distinct, and sometimes (*Iphione*) the upper layer becomes chitinized.

(3) In focusing deeper than the upper layer of cells, Ehlers states that he could distinguish a series of dots, which he represents as arranged in radiating lines, and which he regards as indicating the existence of some tissue between the two layers in the "cavity" of the scale.

* Die Borstenwürmer, p. 109 (1864).

It has been generally assumed by Quatrefages*, among others, that the scale is a flattened sac, between the two walls of which is a narrow cavity communicating through the scale-tubercle with the cavity of the body. Evidence in favour of this supposition is afforded by the fact that, in the case of certain species, specimens have been observed with all the scales distended and globular, as if blown up by the pressure of fluid from within. I have never seen this phenomenon, which seems to be very rare; it is probably due to a forcible contraction, similar to that which causes the throwing-off of the scales, forcing the perivisceral fluid through the scale-tubercle into the space between the two layers, and causing a rupture of the intermediate tissue.

That this is the true explanation of the phenomenon in question will be evident if we examine the structure of the scales in *Aphrodita* †. Here we find that the two membranes of which the scales are composed are firmly united together by fibrous tissue, and require some little force to separate them. This fibrous layer is visible in the undissected scale by focusing through the external membrane, and is seen still more distinctly when the two membranes are separated, when the torn fibres will be seen curled up on the inner surface. This central tissue consists of exceedingly fine fibres, which are sometimes arranged in definite interlacing bundles, while in other instances they cross one another irregularly in all directions. Morphologically this layer may be taken to represent the muscular layer of the integument.

In his account of the structure of the nervous system in *Aphrodita aculeata* ‡, M. de Quatrefages makes no mention of the existence of nerves in the elytra. Ehlers § seems to have been the first to observe their presence in the elytra of *Polynoë*. In *Polynoë pellucida* he found a nerve entering the scale through the scale-tubercle, and branching throughout the scale. A similar arrangement is very well seen in the scales of *Aphrodita* and some species of *Lepidonotus* and *Polynoë* after they have been strongly stained with hæmatoxylin or cochineal. The nerve divides near the point of entrance into numerous branches, which radiate towards the periphery and become divided again and again, giving off numerous minute twigs. The termination of many of the ultimate twigs in relation to the processes on the surface of the

* Histoire Naturelle de Annélés, t. i.

† *A. australis*, Baird, the Australian sea-mouse.

‡ "Sur le système nerveux des Annelides," Ann. des Sci. Nat. 3e série, t. xiv. p. 362.

§ Die Borstenwürmer, p. 110.

scale may be well seen in successfully-stained elytra of species of *Polynoë*; and there can be little room for doubt that these processes or papillæ are, in many instances at least, the end-organs of this elytral nerve.

The functions with which the elytra may be supposed to be connected are (1) protection, (2) the production of phosphorescent light, (3) sensation, and (4) incubation.

(1) The protective function of the scales is in some cases the predominating one. Thus in *Iphione* the scales are of extreme density, and cover the entire dorsal surface with a complete armour, which the animal is incapable of throwing off, and which gives it a remarkable resemblance to a Chiton. In others the scales, though tough, are more readily detached, and in many instances do not completely cover the dorsal surface; in many species of *Polynoë* again, they are so delicate, and are so readily parted with when the animal is irritated, that their direct protective action must be very slight; while in genera such as *Aphrodita*, in which the dorsal surface is covered with matted hairs, the presence of elytra from this point of view seems unnecessary.

(2) When certain species of *Polynoë* are irritated in the dark a flash of phosphorescent light runs along the scales, each being illuminated with a vividness which makes it shine out like a shield of light, a dark spot near the centre representing the surface of attachment where the light-producing tissue would appear to be absent. The irritation communicates itself from segment to segment; and if the stimulus be sufficiently powerful, flashes of phosphorescence may run along the whole series of the elytra, one or more of which then become detached, the animal meanwhile moving away rapidly and leaving behind it the scale or scales still glowing with phosphorescent light. The species in which the phenomenon of phosphorescence occurs are species characterized also by the rapidity of their movements, and also by the readiness with which the scales are parted with; and it seems not at all unlikely that the phosphorescence may have a protective action, the illuminated scales which are thrown off distracting the attention of an assailant in the dark recesses which the Polynoidæ usually frequent.

(3) That the elytra act, like the dorsal cirri, as organs of some special sense seems probable from their abundant innervation, as well as from the presence, in many instances, of fimbriæ and other appendages, some of which at least act as end-organs for the nerve-branches. These appendages, the form of which varies greatly, are processes of the upper wall of the scale, and probably consist of the cuticular, subcuti-

cular, and fibrous layers of the latter. The subcuticular layer is in most instances difficult to be distinguished; but in one species of *Polynoë* I find that certain vesicular appendages scattered over the surface of the elytra show distinctly beneath the delicate cuticle a layer of polygonal squames, and in the interior a series of fibres which radiate from the base of the vesicle to its outer wall, and may represent the fibrous layer of the wall of the scale, or may be special nerve-endings.

(4) The sexual products reach the exterior through apertures in the bases of the parapodia; and the ova are carried by ciliary action to the under surface of the scales, where they remain, adhering by means of a viscid matter, till the embryos are well advanced. Impregnation probably takes place while the eggs are in this situation; and I have found still crowding in great masses under the scale embryos which had reached the advanced cephalotrochous stage first described by Sars * in *Polynoë cirrata*.

Sydney, July 1, 1882.

XXII.—*Note on* Keramosphæra, *a new Type of Porcellanous Foraminifera*. By Henry B. Brady, F.R.S.

[Plate XIII.]

Towards the end of last year I received from the 'Challenger' office a little white spherical Foraminifer, accompanied by a request that I would identify the species. I was then far from home, and without any better means of examining the specimen than that afforded by a simple magnifying-glass, viewed by which it appeared to be nothing more than a rather fine example of the globular variety of *Tinoporus* (*Gypsina*)—somewhat larger than usual for a recent specimen of that genus, but inferior in size to some of those found in the fossil condition, and scarcely so regular in contour. Owing to absence from England, I had no immediate opportunity of reverting to the subject, and had scarcely thought again about it, until a few weeks ago, when, in conversation with Mr. Murray, I learnt that the specimen had been sent to me because it appeared to differ in important particulars from *Gypsina*, and also because it was found at much greater depth than usually affected by that type. At the same time he placed in my hands another similar shell, which had been obtained by further search in the

* "Zur Entwickelung der Anneliden," Archiv für Naturg. 1845, pp. 11–19.